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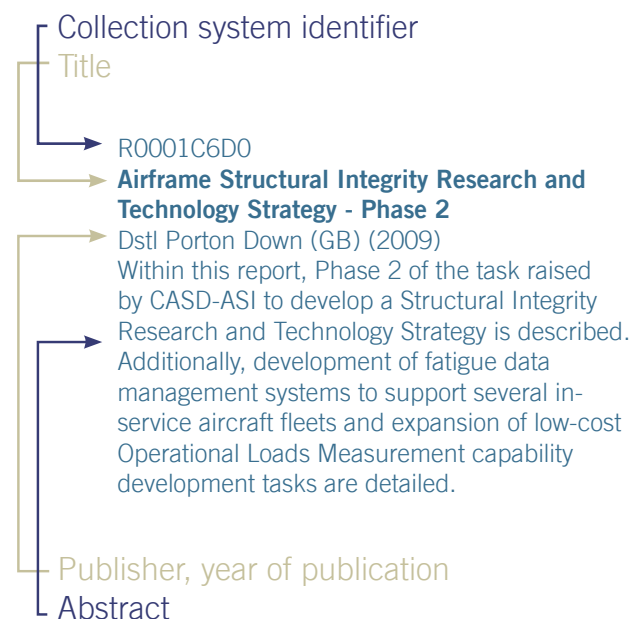
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Defence Science and Technology



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Defence Reports

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R00025742

Application of store-local-query-anywhere paradigm to a distributed proposition store

Dstl Portsmouth West (GB) (2010)

This paper compares resilience, network loading, and security properties of the store-locally-query-anywhere paradigm (from the US-UK ITA (International Technology Alliance)) compared with a traditional centralised data base system. It also shown that this paradigm is well suited to implement a Virtual Knowledge Bases (VKB) comprising a distributed proposition store and associated query and reasoning mechanisms which can access all the data in the VKB from any node. Seven enhancements to the original software have been proposed which would enable such a VKB to operate more effectively, more robustly, and with reduced network loading. Five of these proposed enhancements would have more general application - other than in connection with proposition stores. The paper recommends that the next step should be to physically implement such a distributed system and compare its performance with a centralised solution (with replication). Metrics for such a comparison would include query-response-time, network loading, and accuracy of responses in the face of intermittent network connections.

R000246B2

Cognitive bias, critical thinking and the Intelligence

Analyst: Summary Report

Dstl Farnborough (GB) (2008)

This paper is based on a review of the scientific literature base providing the foundation for an Intelligence and Information Operations Skills research project, which aims to develop the skills, tools and techniques needed to support Defence Intelligence analysis. The key areas covered in the review are: critical thinking, sense and decision-making, cognitive bias, complexity and intelligence qualifiers. The report highlights general implications for Intelligence analyst skills development as well as providing focus areas for further research within the project.

R00022C2B

CWID 10 Assessment and Benefits Analysis Plan

Dstl Portsmouth West (GB) (2010)

This document describes the Assessment and Benefits

Analysis method proposed for CWID 10 (Coalition Warrior Interoperability Demonstration). The 2010 method proposed is similar to that used in 2009, but with several significant improvements. The key improvements are: Military Advisors will be part of the Assessment Team; Dstl Human Systems Group (HSG) will be providing guidance on the entire Assessment process; a detailed Trial Assessment Plan will be produced for each Trial defining the stakeholders, their roles and responsibilities with deadlines for deliverables; a recorded facilitated meeting of Assessors will take place after each assessment. This will allow the experts to discuss and hopefully agree their findings. It also relieves them of having to complete questionnaires themselves, thus maximising their time for discussion of the Trial; the Trial Company will have the opportunity of commenting on the results of the Assessment.

R0002584D

Enhanced Capability Armoured Vehicle Training System Operational Analysis Main Report

Dstl Fort Halstead (GB) (2010)

An audit trail of operational analysis evidence generated to support the Enhanced Capability Armoured-Vehicle Training System (ECATS) procurement strategy and to inform recommendations for AFV gunnery and driving training options. Addresses the impact on battle outcome of AFV gunnery and driving training. The cost effectiveness of alternatives to current training solutions are considered and compared. Battle outcome and loss exchange ratios are sensitive to training performance assumptions. There are significant benefits, in terms of loss exchange ratio, in improving gunnery standards beyond the current Army Shooting Policy level. Although driving standards are not tested for or set by the Army, the limited exercise data available to this analysis suggest that there is significant variation around the mean driver performance. Higher driving standards also lead to favourable battle outcomes.

R000248A8

High Capacity Communications from Airborne Platforms

Dstl Porton Down (GB) (2010)

In order to provide high capacity data over a wide area, the role of airborne platforms within the communications infrastructure is investigated. In order to minimise system costs the potential to use commercial off the shelf (COTS) communications technology within this airborne infrastructure is also discussed. A number of different architectures, such as airborne payload, airborne relay and a layered approach, are proposed and analysed. It is recognised that a key issue to address is the control and management of radio spectrum interference when multiple platforms are deployed. Analysis results show the scale of the interference and how this is affected by platform height and separation. Potential solutions to the interference problem are antenna beamforming and more flexible frequency reuse schemes, which can both be leveraged

from civil systems. Future work will carry out detailed assessments of the alternative architectures and determine the effectiveness of alternative COTS bearer technologies.

R000254BE

Investigation of MODAF for DOTC(A) Interface Control Document

Dstl Portsmouth West Fareham (GB) (2010)

This report discusses Dstl's investigation of the potential application of the MOD Architecture Framework (MODAF) for the development of the Defence Operational Capability (Air) Interface Control Document. MODAF aids the development and communication of a coherent model of a system architecture, taking into account multiple perspectives (including Strategic, Operational, Systems and Acquisition). It is a framework for organising information, and provides no method to support the generation or elicitation of that information. DOTC(A) has important differences to the conventional military procurements that MODAF was designed for - in particular, the degree of flexibility required and the need to consider both operational and training issues.

R000253D3

Mallows' Cp and Parameter Selection in Regression Analysis

Dstl Portsmouth West (GB) (2010)

The aim of this paper is to provide an awareness of the different methods that can be used to select appropriate predictors for inclusion in a regression analysis model. There are many techniques available for deciding between models, the most appropriate one to use depends on the estimation method used, whether the model is intended to be descriptive or predictive, and the type of data used. As a starting point, this paper provides a brief non-technical description of the Mallows' Cp statistic and its appropriate usage. Other methods are then considered in comparison to Mallows' Cp, to determine how Mallows' Cp fits in with other regression fit methods that are currently being used.

R00024A5A

Operational Analysis: Historical Perspectives and Future Challenges

Dstl Portsmouth West (GB) (2010)

This is a conference paper describing the history of Operational Analysis as practised within UK government circles from the Second World War to the present day. It describes challenges in current analysis, including the analysis of the contribution of the non-Equipment Defence Lines of Development to overall effectiveness.

R000256AD

Oral and intraperitoneal toxicity of ricin in the Balb/c mouse

Dstl Porton Down (GB) (2010)

If ricin toxin is deployed by an aggressor, emergency responders will need to enter the potentially contaminated area. First responders may not have full protective equipment and it is, therefore, important to know the magnitude of risk posed to them. Thus, there is a requirement to assign no observable adverse effect levels and low observable adverse effect levels to human

subjects. Ideally, the most appropriate situation is where hazards have been evaluated directly in humans, but for ricin, this is not the case. The next most appropriate situation is to use data originating from animal studies. A thorough literature search has identified a paucity of detailed studies on inhalation, oral or ocular administration of ricin in animals which would enable no observed adverse effect level (NOAEL) or lowest observed adverse effect level (LOAEL) to be estimated in man. A few toxicity studies have been undertaken to assign LD₅₀ values but insufficient information is available to reliably predict the other levels. This is especially true for the oral route. This study was set up to enable some confirmation of published LD₅₀ information of orally dosed ricin but also to enable some knowledge to be gained on no and low observable adverse effects. It was also convenient to compare toxicity information for ricin administered by the intraperitoneal route. The data from this study correlated well with published toxicity data and also supplied ball park dose levels for NOAEL and LOAEL in the mouse.

R00021F27

Particulate Non Destructive Testing of Naval Filters Part 3 - Comparison of aerosol test methods

Dstl Porton Down (GB) (2010)

This report reviews the aerosol generation methods for use in the testing of High Efficiency Particulate Air (HEPA) filters and filter installations for naval CBRN filtration systems. A comparison of the available particle size data shows the thermally generated salt aerosol and oil generated aerosol to be more penetrating than that produced from salt solution using a Collision generator. The implications of the comparison on the filtration performance requirements for both factory HEPA testing and for on board testing of naval filter installations are discussed.

R00021992

Political-Military Games: A Practitioner's Guide

Dstl Portsmouth West (GB) (2010)

This paper provides practical guidance, based primarily upon the author's own experiences, for Dstl analysts engaged in the design, management and reporting of political-military games.

R0002519D

Preliminary assessment of the factors affecting autonomous precision aerial delivery: Parachute performance, system components and deployment and weather conditions

Dstl Porton Down (GB) (2010)

This report has been generated, based on information substantively supplied by ICL but also contains contributions from experts and users within the military community. Initial focus has been placed on the performance and limitations of current parachute/parafoil systems; the architecture and deployment of typical autonomous precision aerial delivery systems and the factors which produce challenging weather conditions. More specifically, section 2.1 describes the basic physics which underpins the performance of conventional round parachutes as well as their limitations with respect to use in precision aerial delivery

applications. Section 2.2 describes how the anatomy of gliding parachute (parafoil-based) systems provides the requisite agility and manoeuvrability to more accurately navigate a payload. It also describes, in simple terms, the extent to which the current designs still constrain the kinematics and trajectory of a delivery system and it is noted that lack of rigidity, a fixed angle of attack as well as parasitic drag issues result in performance which is considerably lower than that observed with an aircraft wing. Section 2.3 discusses the components which make up the complete autonomous aerial delivery system and deployment strategy which is adopted to encourage an accurate mission outcome. Here it is noted that accurate prediction or sensing of the wind conditions, particularly at lower altitudes, is vital. Section 3.0 qualitatively discusses the mechanisms which underpin the production of wind within the atmosphere with particular emphasis on the roughness and geometry of the underlying topography as well as thermal effects in mountainous regions. The conclusions are stated in section 4.0 and recommendations for immediate future study are made in section 5.0.

R000257B9

Review of Open-source Text Mining Software

Dstl Porton Down (GB) (2010)

This report reviews currently available open source software useful in analysing textual information gathered during military operations relating to improvised explosive devices (IEDs). A case is made for the open source business model as being more technically open and reactive to new developments in the field. An outline of current problems and future developments in text mining is provided. The report concludes with a set of recommendations both of suitable software packages and, in outline, suggestions for exploitation of text mining in the counter-IED domain.

R00025206

Technical Review of JSP 482, Chapter 11, Annex E - the Treatment of Explosives Exposed to Chemical Warfare Agent Contamination

Dstl Porton Down (GB) (2010)

Dstl were tasked to review edition 3, of JSP 482, Chapter 11 Annex E which details the treatment of explosives exposed to chemical warfare agents in periods of tension/crisis and war. Initial review indicated that, although the document was not inherently incorrect, it was out of date and a complete re-write would be preferential. The main areas of concern were as follows: Many of the explosive materials referred to are obsolete suggesting a considerable vintage for the original source material; the possible consequence of mixing decontaminants with explosive materials was not made clear; the ability of liquid agents to ingress into absorbent materials and provide a long term off-gassing hazard needed further clarification; the ability of liquid agents to ingress into cracks, crevices and screw threads and provide a long term off-gassing hazard needed further clarification; clarification of the levels of decontamination was required, in particular what was realistically possible in an active theatre and how it would impact handling and transportation activities. This document contains the reworded text in the same format as the original JSP.

R00024AA5

The Environmental Impact of Aluminium Alloy Mortar Bomb Tailfins

Dstl Porton Down (GB) (2009)

The Defence General Munitions Project Team (DGM PT) tasked the Defence Science and Technology Laboratory (Dstl) to undertake a study of the environmental impact of Aluminium Alloy (AA) from in-service mortar bomb tailfins, using the Salisbury Plain Training Area (SPTA) as a model. This report outlines the environmental risks of in-service mortar bomb tailfins. It reviews open literature sources, international Defence papers and legislative standards and guidance. The rates of corrosion of AA are low (generally around 0.2g over 50 years for a single tailfin). A comparison of the potential rates of release of aqueous aluminium and other environmental risk factors at SPTA, indicates that the overall risk of an impact is low. The principal mechanisms by which an impact could have occurred would have been through contamination of water supplies or the pools used by the Great Crested Newt.

R00024191

The Impact of Clutter on ISTAR and Combat Modelling

Dstl Fort Halstead (GB) (2010)

This report describes a series of related studies undertaken between 2003 and 2009 to investigate the effects of microterrain and environmental clutter on military intelligence, surveillance, target acquisition and reconnaissance (ISTAR), and aspects of combat, and how these might be represented in operational analysis (OA) studies. It examines the effects of map and terrain database resolution on the predicted intervisibility of units on the battlefield. It reports several studies to count the number of potential clutter objects in accessible urban and rural environments, and a discussion of their potential impact on ISTAR performance. It also reports some exploratory modelling of clutter and microterrain, to assess its effects on search by unmanned aerial vehicles, and its effects on simulated close combat.

R000251EC

A survey of vibration produced by generators onboard RFA Fort Rosalie

Institute of Naval Medicine (GB) (2010)

An assessment was conducted to determine the vibration occurring onboard a Royal Fleet Auxiliary ship Fort Rosalie during operation of the four auxiliary generators. Accelerations were measured in three locations (deck, seat and bunk) in 11 cabins and compartments on 2 Deck with the ship moored alongside at DSDA Crombie. The data have been assessed and interpreted in accord with current standards concerned with health and comfort aspects of human exposure to whole-body vibration: BS 6841, ISO 2631 -1, PA(V)D and CVAWR. Assessments were also carried out in accord with a building vibration standard (BS 6472) and a standard concerned with habitability on ships (BS ISO 6954). Acceleration data show that the frequency-weighted vibration magnitudes measured on the ship could be termed as being "not uncomfortable". Measurements in most compartments investigated showed vibration magnitudes that could result in vibration-related complaints. Continued exposure to such vibration magnitudes would increase the likelihood

of adverse comments from the vibration-exposed personnel. No appreciable changes were observed in the vibrations occurring in the cabins following a recent refit.

R000251ED

An Assessment of Noise in Accommodation Spaces Onboard RFA Fort Rosalie

Institute of Naval Medicine (GB) (2010)

A noise survey was conducted in accommodation spaces onboard an RFA ship Fort Rosalie, following a period of refit and maintenance. Noise measurements were made in two locations in 11 compartments on 2 Deck during operation of the four generators; the ship was moored alongside. The data have been assessed and interpreted in accord with The Department of Transport's Code of Practice for Noise Levels in Ships (1990). The data have also been assessed against noise measurements that were made during a survey conducted in 2007. The A-weighted equivalent continuous sound pressure levels obtained in the compartments ranged from 52 dB(A) to 59 dB(A) and were below the recommended Maximum Noise Level of 60 dB(A) specified in the standards when both port and starboard generators were operating. The data showed a reduction in ambient noise compared with the corresponding values obtained in the noise survey conducted in 2007.

R0002520E

Monitoring noise exposure in the Motor Transport Workshop, Joint Services Unit Gibraltar

Institute of Naval Medicine (GB) (2010)

Noise exposure within the MT Workshop, JSU Gibraltar has been assessed in accordance with the Control of Noise at Work Regulations 2005 during the use of various pneumatic tools. The highest continuous equivalent noise level (L_{Aeq}) measured was 102 dB(A), produced when using a pneumatic wrench - exposure to this level for just 17 minutes in any 8-hour day will cause the exposure limit value to be reached. A table has been produced to enable tool operators to calculate their daily noise exposure depending on the activities carried out and the duration. Recommendations are made to reduce noise levels at source by attaching air exhaust silencers to the tools.

R00024D21

Submarine Exposure Limit Review: Vanadium

Institute of Naval Medicine (GB) (2010)

Toxicology of vanadium is reviewed with a view to setting limits for exposure in HM submarines. Health based time-averaged exposure limits are derived for continual patrol exposure. The limits recommended in this report should form the basis for the setting of operational Continuous Exposure Standards (CESSs).

R00024AB7

Surgeon General's Armed Forces Feeding Project: An Evaluation of Physical Training Progression, Dietary Intake & Bone Health in Royal Air Force Phase-1 Recruits at Raf Halton; Interim Report III (Recruit Intake 433 Apr - Jul 10)

Institute of Naval Medicine (GB) (2010)

The Institute of Naval Medicine (INM) was tasked by Surgeon General's (SG) Research Strategy Group (RSG) to undertake a programme of work that examines nutrition for UK Armed Forces. The INM has also been tasked by SG's RSG to examine the relationships between nutritional intake, bone health, and stress fracture incidence during military recruit training. The aim of this study was therefore to evaluate the nutritional, physiological and illness and/or injury experiences of RAF recruits undertaking the 9-week Phase-1 training syllabus at RAF Halton. The purpose of this third interim report was to present the physical fitness, anthropometry and estimated bone mass data (assessed by Broadband Ultrasound Attenuation, BUA) of the third intake of male and female recruits (Recruit Intake 433 Apr - Jul 10). Phase-1 training resulted in improved physical fitness in both male and female recruits. Improvements in fitness were associated with a decrease in percentage body fat in male recruits, and an increase in total body mass in female recruits. The dietary intake data of this recruit intake was not available at the time of this report's preparation, but will be included in the final report on this work programme.

R0002558D

Vibration measurements in Lynx simulators at RNAS Yeovilton

Institute of Naval Medicine (GB) (2008)

Whole-body vibration measurements were made in Lynx Mk 3 and Mk 8 flight simulators. Acceleration measurements were made in the seats (pilot's, observer's and instructor's seats) with the simulators involved in different flight manoeuvres. Three translational axes of vibration were measured in each seat. The data have been assessed and interpreted in accord with current standards concerned with health and comfort aspects of human exposure to whole-body vibration: ISO 2631-1, PA(V)D and the Control of Vibration at Work Regulations 2005. Maximum single axis frequency-weighted vibration magnitude of 0.3 ms to the power -2 r.m.s. was measured on a crew seat. Vibration exposure of all crewmembers would not be expected to reach the 'daily exposure action value' specified in the CVAWR. It is recommended that all crew members be informed and trained on the forms of actions that they can take to reduce their exposure to vibration.

R00021F9D

Vortex Breakdown Over Slender Delta Wings

North Atlantic Treaty Organisation (FR) (2009)

The report contains a study of the phenomenon of leading-edge vortex breakdown over slender delta wings conducted by the NATO/RTO/AVT Task Group AVT-080. After an introduction and discussion of highlights, a chapter is devoted to a critical assessment of available experimental studies of the vortex breakdown phenomenon. Eight reliable experimental data sets are collected and compiled. These data sets are described in separate chapters and were obtained on more or less identical delta wing models tested in different wind tunnel test facilities. The datasets include time-average results at static model conditions, ensemble-average

results at dynamic model conditions and unsteady results at static/dynamic model conditions. Based on the critical assessment, a benchmark test case is selected that provides sufficiently reliable data for validation of the numerical predictions. In separate chapters ten state-of-the-art numerical solutions from various research institutes are described that have been obtained for the benchmark test case configuration and test conditions. Studies of the effects of parameters like grid density, turbulence modelling, time scaling, etc., have been performed. In addition, for a special delta wing configuration, the effects of tunnel wall interference and of interactions between vortices have been calculated. In the final three chapters advanced analytical methods are described. The report is of great value to scientists involved in the development of design methods for military aircraft configurations, but also for high speed civil and/or space aircraft.
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R00025535

Computational Fluid Dynamics Investigation into the Airwake about a Landing Helicopter Docks Ship for Helicopter Operations

Defence Science and Technology Organisation (AU) (2010)

This report documents the conduct and results of an unsteady Computational Fluid Dynamics (CFD) simulation of the airwake about a Landing Helicopter Docks (LHD) ship for various wind-over-deck angles for helicopter operations. The CFD analysis was aimed at identifying significant flow structures which may potentially impact on shipboard helicopter operations. The CFD results were validated using a series of wind-tunnel experiments. The analysis showed that the flow field about the flight deck varies significantly with varying relative wind angle. Furthermore, large variations in the flow structures between landing spots are shown to exist for particular relative wind angles. A summary of a range of relative wind angles which may potentially be detrimental for ship-helicopter operations aboard the LHD is provided in this report. The CFD results should be reviewed to aid in the development of the LHD specific Ship Helicopter Operating Limits.

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R00023C48

Evaluation of Alternative Helicopter-Ship Landing Limit Systems using Pilot in the Loop Simulation

Defence Science and Technology Organisation (AU) (2010)

A study into alternative landing limit systems has been undertaken by DSTO to improve helicopter-ship landing operations. A Pilot in the Loop simulation experiment was used to test the algorithms of selected landing limit systems including two variations of the Flight Deck Motion System, the filtered and extended versions of the Landing Period Designator, and the Maritime Helicopter Aid (formerly known as the Deck Availability Designation System). This experiment examines the effectiveness of performing safe landings while operating these algorithms in real-time

as supplementary information to the pilot. It consolidates upon preliminary analytical studies that explored the theory of various landing system options and their time availability for landing compared to current Royal Australian Navy practices.

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R00024992

Joint Tactical Air Defence Architecture

QinetiQ (GB) (2007)

The Joint Tactical Air Defence Integrated System (J-TADIS) research programme is aimed at demonstrating the feasibility and utility of integrating Air Defence (AD) elements in a tactical manner. This paper (along with other outputs) will inform MOD decisions concerning the future focus of research and equipment capability programmes and the possible provision of a fielded J-TADIS capability. This working paper establishes an architecture (set of MoD Architecture Framework (MoDAF) views) for an 'as is' (2010) Joint Tactical Air Defence (JTAD) capability in order that operational shortfalls (process and/or system) that hinder the ability to perform a less procedural and therefore more dynamic JTAD may be identified.

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